Procedia Engineering, 2017, vol.206, pages 1292-1297

Kinematics of Spherical Milling Cutters Forming

Khisamutdinov R., Sungatov I., Khisamutdinov M.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2017 The Authors. Published by Elsevier Ltd. The mathematical relations between the helical surface on the sphere, the formlining, and the process of forming the spherical cutter by the disc-shaped tool are revealed. An algorithm and a program for calculating the spherical milling parameters based on kinematics of formation were developed, taking into account the kinematics of shaping, the determination of the profile of a disk tool for processing a spherical cutter. The effect of the parameters of the helical surface on the profile of the disk tool is investigated. To be able to integrate with other systems in the program, a system of inter-program data exchange - export of table of output variables in Microsoft Excel - was implemented.

http://dx.doi.org/10.1016/j.proeng.2017.10.633

Keywords

complex surfaces, forming, helical surfaces, kinematics of formation, profiling, spherical cutters

References

[1] S.D. Kugultinov, R.M. Khisamutdinov, and M.R. Khisamutdinov Tool Creation and Operation System Development for Large Engineering Enterprises World Applied Sciences Journal (WoS) 30 5 2014 588 591

[2] R.M. Khisamutdinov, and M.R. Khisamutdinov Automation System Goals for the Creation and Operation of the Tool Innovative Mechanical Engineering Technologies, Equipment and Materials-2013, IOP Conf. Series: Materials Science and Engineering (Scopus) 69 2014 1 4

[3] L.A. Simonova, M.R. Khisamutdinov, The problem of the exchange of data between ERP and PLM systems in machine building industry New technologies of science-intensive machine-building: development priorities and training: an international scientific-practical conference (G. N. Chelny), 2013, pp. 341-345.

[4] R.M. Khisamutdinov, and M.R. Khisamutdinov New technology of production preparation on the basis of models, methods and means of automation ofprocesses of creation and operation of the instrument Theses of reports of International scientific-practical conference "Education, science and production. New technologies as a tool of strategy of development and modernization 2020 2012 Publishing house "MSPRESS" Kazan 276

[5] N.A. Chemborisov, R.M. Khisamutdinov, and I.Z. Sungatov Determining the contact zone in disk machining of a complex spherical mill Russian Engineering Research 33 4 2013 243

[6] N.A. Chemborisov, and I.Z. Sungatov End cross section of spherical channel mill Russian Engineering Research 29 11 2009 1180

[7] A.A. Fomin, and V.G. Gusev Spindle Rigidity in Milling Blanks with Nonuniform Properties Russian Engineering Research 33 11 2013 646 648

[8] A.A. Fomin, and V.G. Gusev Vibrational displacement of a spindle with static disequilibrium of the cutting tool Russian Engineering Research 33 7 2013 412 415

[9] A.A. Fomin Vibrational motion of a complex mill under the action of the cutting force Russian Engineering Research 33 1 2013 57 60

[10] A.A. Fomin, and V.G. Gusev Safe machining of blanks with nonuniform properties Russian Engineering Research 33 10 2013 602 606

[11] A.A. Fomin Kinematics of surface formation in milling Russian Engineering Research 33 11 2013 660 662

[12] A.A. Fomin, V.G. Gusev, R.G. Safin, and R.R. Safin Dispersion of the Margin Removed in Complex Milling Russian Engineering Research 35 6 2015 417 420

[13] A.A. Fomin, V.G. Gusev, R.V. Yudin, N.F. Timerbaev, O.Yu. Retyunskiy, Mechanical treatment of raw waste lumber an effective way to preserve the ecology and resources IOP Conference Series: Materials Science and Engineering. 142(1)(2016) 012091. DOI:10.1088/1757-899X/142/1/012091.

[14] V.G. Shalamov, Lectures on Design of Cutting Tools: Method of Profiling Circles for Shaping Helical Surfaces, YuUrGU, Chelyabinsk, 2003, pp. 70-73.

[15] Yu.E. Petukhov, and P.V. Domnin Shaping precision in machining a screw surface Published in STIN 7 2011 14 17

[16] A.V. Isaev, V.A. Grechishnikov, and Sh. Markosh Design of Composite Mills for Machining Complex Surfaces Stanki Instrum 2 2007 13 16

[17] V.A. Grechishnikov, V.A. Kosarev, M.S. Dymov, and D.V. Kosarev Determining the profile of the initial tool surface in planetary machining of internal threads Published in STIN 3 2011 28 32

[18] N.A. Chemborisov, and I.Z. Sungatov Mathematical description of a helical line on a sphere-1 Russian Engineering Research 30 5 2010 520

[19] N.A. Chemborisov, and I.Z. Sungatov Mathematical description of a helical line on a sphere-2 Russian Engineering Research 30 4 2010 424

[20] E. Morenoff, J.B. McLean, Inter-program communications, program string structures and buffer files, Proceedings of the April 18-20, spring joint computer conference. - ACM, 1967, pp. 175-183.